INVENTIONS & INNOVATION

Success Story

REUSABLE VACUUM BAGGING FOR MANUFACTURING WITH COMPOSITE MATERIALS

Reusable Vacuum Bagging System Creates Strong Products on the First Try

Benefits

- Flexible silicon diaphragm can be reused 100 to 200 times
- Can convert existing tools or design into new ones
- Concept adaptable to pressurized autoclave mandrills
- Tolerates temperatures to 400°F and autoclave pressures
- Significantly improves process uniformity and product quality
- Speeds production process shortening tool turnaround
- Applications have pay backs after five uses
- Labor costs cut by 40% or more in laminating applications
- Reduces use and expense of disposable materials

Applications

Airtight vacuum bagging system for autoclave or oven curing and debulking of composite parts, design and fabrication of large and small parts made with composite materials for aircraft, aerospace, transportation, electronic, recreation, and other industries.

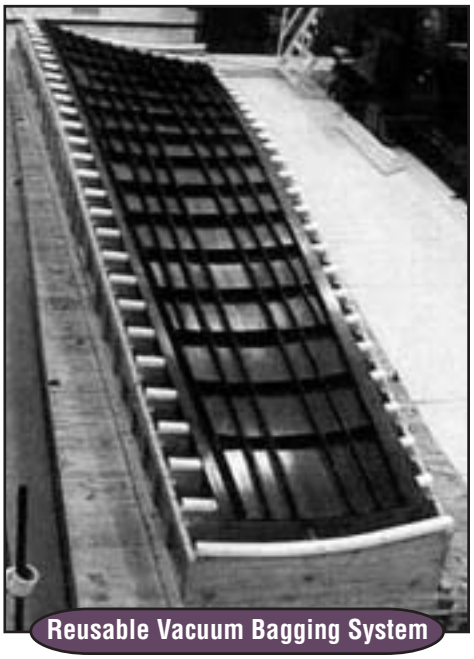
"The DOE grant got our oven calibrated and revised our quality control manual, which enabled us to quanlify as an approved source by Boeing, a watershed even for a company our size."

–Cosby Newsom
President
Bondline Products

While waiting for takeoff, have you ever stopped to marvel at the technology of flight? Incredibly, this flying machine takes you to 30,000 feet and then returns you to solid ground at another location. How are airplanes strong enough to withstand shearing stresses? The answer lies with the use of high-performance composite parts.

Manufacturing high-performance composite parts often requires build up of many layers of continuous-filament or woven-fabric lamina. Voids and air bubbles must be removed between layers to ensure the product meets specifications and will not delaminate. With a grant from DOE's Inventions and Innovation Program, inventor Cosby Newsom demonstrated the merits of a new vacuum-bagging technology to replace a thin-film and sticky-tape method that had prevailed in industry for 40 years. This reusable vacuum bagger uses the same silicon form for 100- to 200-part runs. Depending on the length of production runs, costs per cure have been cut by 40% to 50%.

Companies using Bondline Products' Reusable Vacuum Bagging (RVB) system include large firms such as Boeing, Lockheed, and Goodyear, as well as smaller companies involved in composite material fabrication.



Reusable Vacuum Bagging System

Technology Description

For the last 40 years, manufacturers of high-performance composite parts relied on a process of building up many layers of continuous-filament or woven-fabric lamina to create strong products. The layers were built by placing lamina over a mold to shape the part and then repeating the process. However, this process often created air bubbles and voids in-between layers, which can act as stress concentration points and ultimately delaminate the material under high shearing stresses, resulting in rework and additional costs for the manufacturer. In most operations, a thin sheet of high-performance plastic film was placed over the lamina and a vacuum was used to squeeze out all the voids and bubbles after every few layers. Conventional practice was to discard this sheet of plastic film every few layers, making this an expensive and wasteful process.

Bondline Products has devised a new technology, which employs a Reusable Vacuum Bagging (RVB) System to replace the thin-film and sticky-tape method that has prevailed in industry. This reusable vacuum bagger uses the same silicon form for 100 to 200 production parts, cutting costs by as much as 50 percent through reuse.

System Economics and Market Potential

Bondline Products, under the leadership of inventor Cosby Newsom, was awarded a grant from the U.S. Department of Energy's Inventions and Innovation Program to create a video and handbook that provide practical manufacturing procedures for organizations that want to create RVB Systems at their facilities with materials supplied by Bondline. Bondline Products currently partners with some of the biggest names in the aerospace industry, companies like Boeing, Lockheed, Hughes, and Northrop/Grumman. Two United States patents protect the technology.

The RVB system was first commercialized in 1985. Currently, hundreds of RVB systems, in all shapes and sizes, are operating in the United States, Germany, and Japan. Payback on this technology usually occurs after the production of the fifth part. The savings per part from that point on depend on the number of parts produced. Bondline Products operates out of Norwalk, California, with 8 employees. The company's 1998 sales come in just under $1 million.

Inventions and Innovation Program

The Inventions and Innovation Program provides financial assistance for establishing technical performance and conducting early development of innovative ideas and inventions. Ideas that have a significant energy-savings impact and future commercial market potential are chosen for financial support through a competitive solicitation process. Inventions funded by the program have saved enough energy to light 10 million homes per year. In addition, the program offers technical guidance and commercialization support to successful applicants. Ideas that benefit the Industries of the Future, designated by the Office of Industrial Technologies as the most energy-intensive industries in the United States, are especially encouraged.

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